COURSE TITLE: Foundations of Energy

UNIT TITLE: Nonrenewable--Coal

SECTION 1: General Information and Overview

Grade Level: 9-12

Suggested Number of Lessons: 13-15

Suggested Time to Complete Unit: 3 weeks

Unit Overview: This unit will focus on the energy of coal including the geology, excavation, distribution and various uses.

SECTION 2: Essential Questions

1.	Why is coal such an important source of energy in my home, business and industry?
2.	What are the methods of the extraction of coal and how does that affect me and industry and the workers of the industry?
3.	What is the future for coal as an energy source in Kentucky, the nation and around the globe?

SECTION 3: Major Focus

Technical Content CTE Program of Studies	Learner Activities (Enabling Knowledge and Skills/Processes)	Core Content For Assessment	Academic Expectations
Construction Technology KOSSA Standard AD-002: Demonstrate the ability to learn new processes and steps. **2.1**--Assess the impact of various current and new technologies on the economy.	Using the provided PDF files in the *Coal unit*: **research** and **discuss**: - current and new technologies in coal mining -clean coal for understandings of current energy trends -impact on our nation's energy portfolio and economy. **View** the CD, *Coal Kentucky's Power*	**SC-HS-1.18** Students will: • explain the importance of chemical reactions in a real-world context; • Justify conclusions using evidence/data from chemical reactions. Chemical reactions (e.g., acids and bases, oxidation, combustion of fuels, rusting, tarnishing) occur all around us and in every cell in our bodies. These	**2.1** Students understand scientific ways of thinking and working and use those methods to solve real-life problems.

2.3-5.5--Develop competencies in the safe and efficient use of the tools, machines, materials and processes of energy technology.	*Source.* **Brainstorm** and **summarize** why coal is a major supplier of electricity and its impact on the economy. Students will use the KWL sheet to **identify** learning regarding coal technology. Students will **discuss** the geology of coal and **work** in groups to develop a model of the earth and show where coal is located and why it is in earth's geology.	reactions may release or absorb energy. **DOK 3**	**2.2** Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events.
Construction Technology KOSSA Standard AD-003: Implement new processes given oral instructions. **2.1-2.3--**Engaging in meaningful hands-on, minds-on conceptual based activities in the area of energy technologies. **2.18--**Analyze how supply and demand impact Kentucky's economy in relation to energy.	Using the resource files on the CD and "*This Mine of Mine,"* **use** a map of Kentucky and the USA, **identify** areas that are being mined. **Discuss** methods of extracting coal. That information will be assessed in the activities, *This Mine of* Mine which include **developing** a pie chart of coal used for electricity production. **View** the CD, *Clean Coal Technologies*. **Summarize and discuss** production and technological advances in mining and the impact it has on the environment.	**SC-HS-1.2,2** Students will: • explain the relationship between electricity and magnetism; • Propose solutions to real life problems involving electromagnetism. Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces or "fields" and moving magnets produce electric forces or "fields". This idea underlies the operation of electric motors and generators. **DOK 3**	**5.1** Students use critical thinking skills such as analyzing, prioritizing, categorizing, evaluating, and comparing to solve a variety of problems in real life situations. **6.2** Students use what they already know to acquire new knowledge, develop new skills, or interpret new experiences.
Construction Technology KOSSA Standard EA-005: Display initiative.	Using the resource CD and the activities in the document *Energy on Public Lands*, **explore** coal properties, laws and	**SC-HS-4.6.1** Students will: • explain the relationships and	**2.2** Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and

Students will investigate with teacher guidance the role of hydrogen technology in the future. **5.1--**Compare the pros and cons in the use of the various energy sources. **Construction Technology KOSSA Standard AC-002**: Students will identify methods of planning that will save costs on time and materials.	**interpret** findings. **Share** findings with class. **Develop** a power point presentation on the new or emerging technologies researched regarding coal. Students **listen** to guest speaker from the coal industry addressing an overview of the whole industry that includes safety and hazards. **Summarize and record** information delivered focusing on costs of coal as an energy resource.	connections between matter, energy, living systems and the physical environment; • Give examples of conservation of matter and energy. As matter and energy flow through different organizational levels (e.g., cells, organs, organisms, communities) and between living systems and the physical environment, chemical elements are recombined in different ways. Each recombination results in storage and dissipation of energy into the environment as heat. Matter and energy are conserved in each change. **DOK 3**	predict possible future events.
2.18--Analyze how supply and demand impacts Kentucky's economy in relation to energy.		**SC-HS-4.6.4** Students will: • describe the components and reservoirs involved in biogeochemical cycles (water, nitrogen, carbon dioxide and oxygen); • Explain the movement of matter and energy in biogeochemical cycles and related phenomena. The total energy of the universe is constant. Energy can change forms and/or be transferred in many ways, but it can neither be created nor destroyed. Movement of matter between reservoirs is driven by earth's internal and external sources of energy. These movements are often accompanied by a	**2.4** Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

		change in physical and chemical properties of the matter. Carbon, for example, occurs in carbonate rocks such as limestone, in the atmosphere as carbon dioxide gas, in water as dissolved carbon dioxide and in all organisms as complex molecules that control the chemistry of life. **DOK 3**	
Construction Technology KOSSA Standard EA-009: Students will show an understanding of established guidelines for safety in the mines.	**Observe** a video and **visit** a mine site that depicts safety issues of surface and underground mining techniques. **Discuss** hazards associated with mining and mine safety from state and federal regulations.	**SC-08-4.6.2** Students will: • describe or explain energy transfer and energy conservation; • evaluate alternative solutions to energy problems. Energy can be transferred in many ways, but it can neither be created nor destroyed **DOK 3**	**2.6** Students understand how living and nonliving things change over time and the factors that influence the changes.

SECTION 4: Culminating Project with Scoring Guide

Students in pairs will create and present a power point over an issue dealing with coal as a source of energy. The slide presentation will have between 8-12 slides and the presentation will take 10-15 minutes to present. Preapproval of project from teacher is necessary.

SCORING GUIDE:

CATEGORY	4	3	2	1
CONTENT	EXTENSIVE- CONTENT BEYOND WHAT IS TAUGHT IN CLASS	GOOD- EXPLANANTION OF CONCEPTS COVERED IN CLASS	BASIC – WHAT HAS ALREADY BEEN COVERED IN CLASS	LIMITED- DOESN'T COVER MATERIAL AS WELL AS DONE IN CLASS
TECHNOLOGY	EXTENSIVE- POWER POINT WITH EXCELLENT ANIMATION AND PICTURES	APPROPRIATE- POWER POINT HAS SOME ANIMATION AND PICTURES	BASIC- POWER POINT WITH LITTLE ANIMATION AND PICTURES	LIMITED – POWER POINT WITH NO ANIMATION OR PICTURES

PRESENTATION	EXCELLENT- FLOWS WELL, AUDIENCE VERY ATTENTIVE- WELL REHEARSED	GOOD – FLOWS WELL PARTICIPANTS KNOW MATERIAL WELL	BASIC – FLOWS UNEVENLY MAY HAVE SOME READING OF NOTES OR SLIDES	LIMITED- PARTICIPANTS READ FROM NOTES OR SLIDES
INTEREST	EXTENSIVE – PARTICIPANTS MAKE MANY EXTENSIONS AND EXPLANATIONS	APPROPRIATE – ENCOURAGES QUESTIONS AND COMMENTS	BASIC – CAN FIELD SOME QUESTIONS	LIMITED – GLAD TO BE THROUGH WITH THE PRESENTATION

SECTION 5: Assessment and Enabling Skills and Processes

Assessment:	Evaluation of class participation.

SECTION 6: Support Materials (i.e., Resources, Technology, and Equipment)

A. Resources	*NEED Secondary Info Book*
B. Technology	Kentucky Coal Council, DOE (Department of Energy)
C. Websites (samples of many available)	www.eia.gov, www.kcc.gov
D. Equipment	Samples of coal grades